DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the network access technique which used the ATM (Asynchronous Transfer Mode) technique and the DSL (DigitalSubscriber Line) technique as the base.
[0002]
[Description of the Prior Art] The spread of the techniques which connect an end user and the Internet to a high speed is demanded with the rapid spread of the Internet.
[0003] Drawing 21 is a common Internet access structure-of-a-system Fig. Direct continuation of a website 2102, a ftp site 2103, and the company (Local Area Network) LAN 2104 is carried out by the dedicated line, and also the access point 2105 which an Internet Service Provider (hereafter referred to as ISP) manages is connected to the Internet backbone 2101.
[0004] From PC (Personal Computer) or LAN, through the access network 2106, the users 2107, such as ordinary end users (home user) and a small-scale place of business, access an access point 2105, and connect with the target site through the Internet backbone 2101.
[0005] Since the Internet backbone 2101 and an access point 2105 are generally connected by the high-speed digital leased circuit, rapid access is secured. On the other hand, generally the access networks 2106 which connect a user 2107 and an access point 2105 are low-speed networks, such as a public telephone network and ISDN (Integrated Services Digital Network), in many cases, although there is also a case of a digital leased circuit network.
[0006] However, it is the actual condition that it is becoming impossible for such a low-speed network to be unable to respond to expansion of the rapid need in recent years over the Internet. Especially, the request to connecting small-scale LAN to the Internet at a high speed is increasing quickly with osmosis of SOHO (Small Office, Home Office).
[0007] Although it is a final solution, since introducing new high speed line infrastructures, such as an optical fiber, to such the actual condition needs great plant-and-equipment investment, an effort, and time amount, a realistic and short-term solution cannot become easily.
[0008] Then, the DSL (Digital Suscriber Line) technique is in the limelight as high-speed communication technology which uses the copper-wire cable for the telephone laid by most current homes and places of business (copper wire cable) as it is, and can coexist with the message by the existing telephone.
[0009] A DSL technique is a kind of a modem technique. Methods, such as ADSL (Asymmetric DSL), SDSL (Symmetric DSL), HDSL (High bit rate DSL), and VDSL (Veryhigh bit rate DSL), are developed the exception of a transmission rate, or the symmetry/asymmetrical transmission by the difference in a strange recovery method etc. at DSL. These name generically and are called xDSL. A phrase called xDSL is used also by future explanation.
[0010] With an xDSL technique, an xDSL modem is installed in the both ends of the established copper-wire cable to which a communication link entrepreneur's hold station is connected in member's house. As a strange recovery method in this case, it is adopted any of three kinds of methods of 2B1Q (2 Binary

1 Quarternary), and CAP (Carrierless Amplitude/Phasemodulation) and DMT (Discrete Multi-Tone) they are. The high-speed communication link of hundreds-several megabits/second is performed between two modems using the high frequency band of 30kHz (kilohertz) - 1MHz (mega hertz) extent using which these strange recovery methods.

[0011] The frequency bands used in an xDSL communication link as mentioned above differ in 30Hz - about 4kHz of frequency bands of a telephone sound signal. Then, it can carry out multiplex [of a voice message signal and the xDSL signal] on the same subscriber line by connecting the frequency discrimination circuit called a splitter to both the xDSL modem in member's house, and the xDSL modem of a communication link entrepreneur. That is, in member's house, telephone and an xDSL modem are connected to a subscriber line through the splitter in member's house. On the other hand, in a hold station, an existing telephone switchboard and an existing xDSL modem are connected to the above-mentioned subscriber line through the splitter of a hold office.

[0012] As an xDSL modem of a hold office, the set-type modem with a multiplexing function called DSLAM (DSL Access Multiplexer) is mainly used. DSLAM carries out termination of the xDSL signal from two or more xDSL circuits by the modem circuit according to individual, respectively, and multiplexes each of those xDSL signals by which termination was carried out on a high-speed backbone interface. By using such DSLAM, it becomes possible to use an xDSL circuit as the low cost and the high-speed access line to various backbones.

[0013] There is an ATM (Asynchronous Transfer Mode) network connected through ATM interfaces, such as the Internet connected through the dedicated line network and LAN which are connected through a high-speed digital leased circuit interface as the above-mentioned backbone, and connect between these branches of a company etc., and a router, and an SONET interface.

[0014] The technique which uses DSLAM as a front end of an ATM network attracts attention as a promising implementation technique of ATM service among these by making the worldwide trend to a communication link entrepreneur ATM-izing a basic trunk into a background. Furthermore, the ATM network is expected also as a network which realizes the Internet backbone 2101 and the access network 2106 which are shown in drawing 21 . When the convenience [cable / existing / copper-wire] of being available is considered to be this fact, with a call service maintained, the meaning which uses the xDSL circuit held by DSLAM as an access line to an ATM network, as a result the Internet is large.

[0015] In this case, IP datagram transmitted towards the website 2102 from PC which a user 2107 owns, or LAN, for example is changed into an ATM cel in the xDSL modem in a user's 2107 **, and that ATM cel is further changed into an xDSL signal.

[0016] The xDSL signal is sent out to the copper-wire cable which is a subscriber line through the splitter in a user's 2107 **, and is transmitted to a hold station. This xDSL signal is received by DSLAM of a hold office after being separated by the splitter of a hold office with a telephone sound signal.

[0017] After multiplex [of the ATM cel received by DSLAM] is carried out to the ATM cel received from other subscriber lines, it is sent out to the ATM interface (for example, SONET interface) which goes to the access network 2106 constituted by the ATM network.

[0018] The ATM cel transmitted in the inside of the access network 2106 is received by the access server in an access point 2105. An access server takes out IP datagram from the received ATM cel.

[0019] This IP datagram is transmitted to a website 2102 via the Internet backbone 2101.

[0020]

[Problem(s) to be Solved by the Invention] Generally, in order to make connection with the Internet, a user 2107 makes point pair point connection first here at the access server in the access point 2105 which is an inlet port to the Internet backbone 2101 using the protocol called PPP (Point to Point Protocol). If at this time, a user 2107 is the address determined according to the protocol called IP (Internet Protocol) from the DHCP (Dynamic Host ConfigurationProtoc ol) server belonging to an access server etc., and an identifiable global IP address is given to him by the meaning on the Internet. After it, or a user 2107 owns from the first, using the global IP address given dynamically, he stores in a PPP packet IP datagram which specified the mutual IP address between the servers of a destination site etc., and it transmits and receives.

[0021] On the other hand, in order for two communication devices to communicate in an ATM network, it is necessary to establish the ATM connection (VC:Virtual Connection/Channel) who needs to give the ATM address to each communication device, and can identify uniquely in an ATM network between two communication devices.
[0022] Therefore, in the technique which unites an xDSL circuit, an ATM network, and the Internet, it is necessary to establish the ATM connection based on assignment of the ATM address between a user 2107 and the access server in an access point 2105 as mentioned above between the xDSL modem in a user 2107, and the access server in an access point 2105 at the time of initiation of a PPP session.
[0023] However, its control and affinity of connection/cutting of an ATM connection were bad in order not to have concepts, such as connection/cutting of an xDSL communication link, for every communication link, since the xDSL technique assumes linking the xDSL modem in member's house, and DSLAM of a hold office directly, and performing a high-speed communication link by low cost.
[0024] For this reason, with the network system with which an xDSL circuit, an ATM network, and the Internet were united, the leased-connection gestalt with which the access server in an access point 2105, DSLAM of a hold office, and the xDSL modem in member's house are always connected by PVC (Permanent Virtual Connection/Channel) into an ATM network was adopted conventionally.
[0025] However, to necessarily always not accessing the Internet, by the above conventional topologies, the ATM connection by whom only the number of users 2107 was always connected was needed, the connection resource in an ATM network (specifically the number of VPI/VCI and the use band of the exchange) will be wasted so much fixed, and common end users, such as a home user, had the trouble of it becoming impossible to be adapted for the subscriber of a large-scale number.
[0026] Although there is also a view of introducing SVC (Switched VirtualConnection/Channel) which is a connection for every call, to this trouble, since the topology of an xDSL communication link assumes connectionless one as mentioned above, the present condition is that affinity with the SVC communication link of a connection mode is bad, and an effective SVC control system does not exist.
[0027] The technical problem of this invention is to realize the topology which makes the connection resource in an ATM network available efficiently, when an xDSL circuit is connected to the specific destinations, such as an access server, through cel switching networks, such as an ATM network.
[0028]
[Means for Solving the Problem] One mode of this invention is premised on the approach of accessing the access server equipment by which the subscriber side modem equipment which performs a strange recovery with a digital subscriber's-loop method is connected to an ATM switching network via the hold station side modem equipment which holds the digital subscriber's loop to which this equipment is connected using the ATM cel transmitted by the Asynchronous Transfer Mode method.
[0029] And access server equipment and hold station side modem equipment are always first connected by the permanent virtual connection. Next, in access server equipment and hold station side modem equipment, an intact virtual connection is managed within a permanent virtual connection.
[0030] And in hold station side modem equipment, an intact virtual connection is assigned to subscriber side modem equipment by performing communication between access server equipment based on the call request from subscriber side modem equipment.
[0031]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail, referring to a drawing.
<System configuration of gestalt of operation of this invention> drawing 1 is the network-system block diagram of the gestalt of operation of this invention.
[0032] A modem 101 is an xDSL modem, and one or more PCs106 are connected through 10 Base-T interface so that it may mention later. A modem 101 and DSLAM102 are connected by the copper-wire cable which is the existing subscriber line.
[0033] In addition, although a splitter can be inserted in a hold office a modem 101 and in member's house between DSLAM(s)102, respectively, it omits about these. An SONET interface connects mutually, respectively between ATM switch 103 comrades, the ATM switch 103, DSLAM102 and the

ATM switch 103, the access server 104 by the side of ISP (Internet Service Provider) and the ATM switch 103, and access server 106 grade.
[0034] Moreover, the access server 104 by the side of ISP is connected to the Internet 105 belonging to the ISP. Other access servers 108 which hold a website 107 and LAN109 to which PC110 is connected are connected to the Internet 105. On this Internet 105, IP communication link which used IP datagram is performed.
[0035] LAN112 which holds PC113 grade other than a modem 101 through DSU (Data Service Unit) 111 is also connectable with DSLAM102. In this case, it is always connected between DSLAM102 and DSU111.
[0036] Furthermore, the access server 114 which supports an xDSL communication link can also be connected to DSLAM102, and LAN115 which holds PC116 grade in the subordinate of the access server 114 can be connected to it.
[0037] Moreover, the access server 117 by which the inside LAN 118 of the company which holds PC113 grade is connected to the ATM switch 103 is also connectable.
<Communication link protocol stack between each equipment> drawing 2 is drawing showing the communication link protocol stack between each equipment which constitutes the network of drawing 1.
[0038] First, it explains, using drawing 2 - drawing 4 about the communications protocol between PC106 and a modem 101 by making into an example the case where data are transmitted to a modem 101 from PC106. In addition, also in the data transmitted to PC106 from a modem 101, it is the same only by data flow becoming reverse.
[0039] User Information (TCP (TransferControl Protocol) segment data etc.) generated with the application in PC106 is drawing 3 (a). A public IP address is stored in the data area of IP datagram specified as the header so that it may be shown. This public IP address is uniquely identifiable in the Internet space in the whole world. When the IP address added to it is identified by the access server 104 (it is only hereafter called the access server 104) by the side of ISP, routing of this IP datagram is carried out, for example, it is transmitted to the website 107 in the Internet 105 of drawing 1, so that it may mention later.
[0040] Next, it sets to PC106 and this IP datagram is drawing 3 (b). It is stored in the data area of a PPP packet where the header and the trailer were added so that it may be shown. After this PPP packet has been recognized with the modem 101 so that it may mention later, termination of it is carried out by the access server 104. Data communication between two points of PC106 and the point pair point of the access server 104 is realized via a modem 101 by this packet.
[0041] Then, it sets to PC106 and an above-mentioned PPP packet is drawing 3 (c). It is stored in the data area of the PPP packet generated based on PPTP (Point to Point Tunneling Protocol) or L2TP (Layer2Tunneling Protocol) so that it may be shown. Termination of this PPTP (or L2TP) packet is carried out with a modem 101 so that it may mention later. PPTP or L2TP is a protocol for making a PPP packet relay to the 2nd equipment by which the 1st equipment is connected to the circuit, in order that the 1st equipment which is not connected to the direct line may perform a PPP communication link through a circuit among the PPP connection partners who can reach. In this case, the PPTP (or L2TP) packet in which the PPP packet was stored communicates the inside of the tunnel of the logic channel between the 1st equipment and the 2nd equipment. With the gestalt of operation of this invention, the PPTP (or L2TP) packet generated with PC106 which is not connected to the direct xDSL circuit is transmitted even to a modem 101 in the inside of the tunnel of private IP channel explained below. A modem 101 takes out a PPP packet from the PPTP (or L2TP) packet, and sends it out to an xDSL circuit towards the access server 104 which is a PPP connection partner. The reason a PPP packet is stored in a PPTP (or L2TP) packet is because a modem 101 can process two or more PPP sessions without conflict. Therefore, an identifier, a sequence number, etc. for identifying each session are stored in the header of a PPTP (or L2TP) packet.
[0042] Next, in PC106, a PPTP (or L2TP) packet is stored in the data area of the UDP datagram generated based on UDP (User Datagram Protocol), as shown in drawing 3 (d). Termination of this UDP

datagram is carried out with a modem 101 so that it may mention later. The port number for identifying PPTP (or L2TP) driver application for the equipment (PC106 or modem 101) which received the PPTP (or L2TP) packet processing it is specified as the header of UDP datagram.
[0043] Furthermore, it sets to PC106 and UDP datagram is drawing 3 (e). The IP address in the private IP address space closed between PC106 and the modem 101 is stored in the data area of IP datagram specified as the header so that it may be shown. Even if an IP address with the public user who owns a modem 101 is assigned only to one by this private IP datagram, the two-way communication using a local address space of the equipment in LAN to which that modem 101 is connected (PC106) becomes possible.
[0044] Finally, private IP datagram mentioned above in PC106 is drawing 3 (f). It is stored in the data area of the Ethernet (trademark) frame generated based on a MAC (Media Access Control) protocol, and is sent out to 10 Base-T interface so that it may be shown. The physical address of the equipment which communicates mutually is specified as the header of an Ethernet frame. Moreover, control for avoiding the collision of the frame on 10 Base-T interface is performed by this frame.
[0045] The Ethernet frame sent out to 10 Base-T interface as mentioned above is drawing 4 (e) after being received in the modem 101. And (d) Private IP datagram is extracted from the data area so that it may be shown.
[0046] Next, it sets to a modem 101 and is drawing 4 (c). UDP datagram is extracted from the data area of the private IP datagram so that it may be shown. Then, it is drawing 4 (b) by that driver by starting PPTP (or L2TP) driver application in a modem 101 based on the port number specified as the header of this UDP datagram. A PPTP (or L2TP) packet is extracted from the data area of UDP datagram so that it may be shown.
[0047] Furthermore, drawing 4 after the PPP session was identified in the modem 101 based on the information specified as the header of the packet (a) A PPP packet is extracted from the data area of a PPTP (or L2TP) packet so that it may be shown.
[0048] Next, it explains, using drawing 2 , drawing 5 , and drawing 6 about a modem 101 and the communications protocol between the access servers 104 by making into an example the case where data are transmitted to the access server 104 from a modem 101. In addition, also in the data transmitted to a modem 101 from the access server 104, it is the same only by data flow becoming reverse.
[0049] For a modem 101, it is drawing 5 (a) first to extract still more public IP datagram (to refer to drawing 3 (a)) from the PPP packet which received from PC106, without carrying out. And (b) The PPP packet is stored in the data area of AAL5 Protocol Data Unit as it is so that it may be shown. AAL5 (ATM Adaptation Layer5) Protocol Data Unit contains the CRC code for data correction in the trailer section.
[0050] Next, a modem 101 is drawing 5 (c). The AAL5 above-mentioned Protocol Data Unit is stored in the payload of one or more ATM cels so that it may be shown. The decision algorithm of the connection of this ATM cel relates to especially this invention. About this, it mentions later.
[0051] Finally, a modem 101 modulates the data stream of the above-mentioned ATM cel to an xDSL signal, and sends it out to a subscriber line. The xDSL signal sent out to the subscriber line as mentioned above is received by DSLAM102 of drawing 1 .
[0052] DSLAM102 extracts an ATM cel by restoring to the xDSL signal received from the subscriber line. Next, DSLAM102 sends out that ATM cel to the SONET interface which makes an optical fiber a physical media (PHY) as it is, without carrying out taking out User Information from that ATM cel, after changing the connection information in the header of this ATM cel. In addition, the signal format of SONET is strictly assembled from an ATM cel at this time.
[0053] An SONET interface top is transmitted to the ATM cel sent out to the SONET interface as mentioned above by one or more ATM switches 103 (drawing 1), being switched on the level of an ATM cel.
[0054] The access server 104 is drawing 6 (d), when one or more ATM cels are received from an SONET interface (PHY). And (c) AAL5 Protocol Data Unit is extracted and assembled from the data area of each ATM cel so that it may be shown.

[0055] Next, the access server 104 is drawing 6 (b). A PPP packet is extracted from the data area of AAL5 Protocol Data Unit so that it may be shown. To the last, the access server 104 is drawing 6 (a). IP datagram is extracted from the data area of a PPP packet so that it may be shown.
[0056] In the access server 104, after carrying out routing of that IP datagram and changing that IP datagram into the physical frame format of an output side circuit by identifying the public IP address specified as the header of this IP datagram, it sends out to the Internet 105.
<Circuitry of modem 101> drawing 7 is the circuitry Fig. of the modem 101 of drawing 1 .
[0057] In the beginning, this modem 101 has the function to transmit the upstream which has predetermined frequency to DSLAM102 through the xDSL driver 712, as a description especially relevant to this invention at a power up. The xDSL driver 712 switches on power sources, such as an xDSL driver to the corresponding xDSL circuit, by detecting this upstream. By this, the power waste at the time of un-communicating can be held down.
[0058] The 10 Base-T hub 701 connects two or more PC106 with the Ethernet cable. Next, PAC (PPTP Access Concentrator)703 offers the client/server ability for controlling PPTP (Point to Point TunnelingProtocol) or L2TP (Layer2 Tunneling Protocol) with PNS(PPTP Network Server) 702 in PC106.
[0059] The PPTP (or L2TP) multiplex circuit 704 in PAC703 drawing 4 (e) mentioned above after receiving an Ethernet frame from the 10 Base-T hub 701 -> (d) -> (c) -> (b) It is shown and makes. ****** -- A PPTP (or L2TP) packet is extracted and the packet is handed over for the PPTP controller 705 corresponding to each PPP session based on the information specified as the header.
[0060] On the contrary, the PPTP multiplex circuit 704 is the PPTP (or L2TP) packet handed over from each PPTP controller 705 to drawing 4 (b). -> (c) -> (d) -> (e) It is order, and an Ethernet frame is assembled, multiplex [of them] is carried out, and it sends out to PC106 from the 10 Base-T hub 701.
[0061] Next, the PPTP controller 705 in PAC703 is drawing 4 (a). From a PPTP (or L2TP) packet, a PPP packet is extracted and it is handed over to SAR710710 connected to the PPTP controller 705 so that it may be shown.
[0062] On the contrary, the PPTP controller 705 is the PPP packet handed over from SAR710 corresponding to it to drawing 4 (a). -> (b) It is order, and a PPTP (or L2TP) packet is assembled and it is handed over to the PPTP multiplex circuit 704.
[0063] The BootP server 706 in PAC703 sets the IP address in the private IP address space closed between PC106 and the modem 101 as the PC106 by communicating with the BootP client 714 in the PC106, when it connects with the 10 Base-T hub 701 and PC106 starts.
[0064] IP tunnel / ATM The VC negotiator 707 is ATM which is IP tunnel link information by PPTP (or L2TP), and the information about an ATM connection. VC (ATM Virtual Connection) information is changed mutually, and the changed information is notified to Q.2931 processor 709 or the PPTP controller 705.
[0065] Moreover, IP tunnel / ATM The VC negotiator 707 receives the transmission speed requested from this controller 705, when the PPTP controller 705 connected to it detects generating of IP tunnel request from PC106. And by asking the resource manager 708 who manages the band of an xDSL circuit, this negotiator 707 arbitrates whether the requested transmission speed is acceptable, and feeds back the transmission speed determined based on the mediation result to the above-mentioned PPTP controller 705.
[0066] Q. 2931 processors 709 are ITU-T. A Q.2931 signaling procedure is followed and it is ATM between DSLAM(s)102. Connection/cutting control of VC is performed. At the time of ATMVC request generating, it is ATM from DSLAM102. Since VPI (Virtual Path Identifier)/VCI for VC (Virtual Channel Identifier) can be assigned, they are set to SAR710.
[0067] SAR (Segmentation And Reassembly unit: cel decomposition and assembly section)710 is the PPP packet handed over from the PPTP controller 705 to which it is connected to drawing 5 (a). - > (b) - > (c) It is order, and an ATM cel is assembled, VPI/VCI notified to the header of the ATM cel from Q.2931 processor 709 is added, and the ATM cel is handed over to the cel multiplex circuit 711.
[0068] Conversely, SAR710 is the ATM cel handed over from the cel multiplex circuit 711 to drawing 5

(c). - > (b) - > (a) It is order, and a PPP packet is assembled and the SAR710 hands it over for the PPTP controller 705 connected.
[0069] The cel multiplex circuit 711 carries out multiplex [of the ATM cel handed over from two or more SAR710], and hands them over to the xDSL driver 712. On the contrary, from the ATM cel group which was handed over from the xDSL driver 712 and by which multiplex was carried out, the cel multiplex circuit 711 separates each ATM cel corresponding to each SAR710, and hands them over to each corresponding SAR710.
[0070]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] A subscriber side terminating set goes via the hold station side terminating set which holds the subscriber's loop to which this equipment is connected using a fixed-length cel. It is the approach of accessing the access server equipment connected to a cel switching network. By the permanent virtual connection, always connect and said access server equipment and said hold station side terminating set are set to said access server equipment and said hold station side terminating set. Manage an intact virtual connection within said permanent virtual connection, and it sets to said hold station side terminating set. The SVC access approach in ATM-DSLAM characterized by including the process which assigns an intact virtual connection to said subscriber side terminating set by communicating between said access server equipment based on the call request from said subscriber side terminating set.

[Claim 2] The SVC access approach in ATM-DSLAM which is an approach according to claim 1, and is characterized by including the process in which an intact virtual connection is managed within said permanent virtual connection in said access server equipment and said hold station side terminating set while exchanging the information about an intact virtual connection to predetermined timing using the broadcasting cel for management maintenance.
[Claim 3] The SVC access approach in ATM-DSLAM characterized by including the process which is an approach according to claim 1 and assigns an intact virtual connection to said subscriber side terminating set in said hold station side terminating set based on the call request from said subscriber side terminating set by communicating using the broadcasting cel for management maintenance between said access server equipment.
[Claim 4] The SVC access approach in ATM-DSLAM which is an approach according to claim 3 and is characterized by what the process in which the identification information of said access server equipment is included in said broadcasting cel for management maintenance with the information about said intact virtual connection is included for.
[Claim 5] The SVC access approach in ATM-DSLAM characterized by including the process in which the virtual connection who is an approach according to claim 1 and was communicating in said hold station side terminating set based on the **** demand from said subscriber side terminating set by communicating using the broadcasting cel for management maintenance between said access server equipment is opened.
[Claim 6] The subscriber side modem equipment which performs a strange recovery with a digital subscriber's-loop method goes via the hold station side modem equipment which holds the digital subscriber's loop to which this equipment is connected using the ATM cel transmitted by the Asynchronous Transfer Mode method. It is the approach of accessing the access server equipment connected to an ATM switching network. By the permanent virtual connection, always connect and said access server equipment and said hold station side modem equipment are set to said access server equipment and said hold station side modem equipment. Manage an intact virtual connection within said permanent virtual connection, and it sets to said hold station side modem equipment. The SVC access

approach in ATM-DSLAM characterized by including the process which assigns an intact virtual connection to said subscriber side modem equipment by communicating between said access server equipment based on the call request from said subscriber side modem equipment.
[Claim 7] The SVC access approach in ATM-DSLAM which is an approach according to claim 6, and is characterized by including the process in which an intact virtual connection is managed within said permanent virtual connection in said access server equipment and said hold station side modem equipment while exchanging the information about an intact virtual connection using the broadcasting cel for management maintenance.
[Claim 8] The SVC access approach in ATM-DSLAM characterized by including the process in which the function which carries out termination of said broadcasting cel for management maintenance which is an approach according to claim 7 and was inputted from the network side in the network interface equipment of said hold station is operated alternatively.
[Claim 9] The SVC access approach in ATM-DSLAM characterized by including the process which is an approach according to claim 6 and assigns an intact virtual connection to said subscriber side modem equipment in said hold station modem equipment based on the call request from said subscriber side modem equipment by communicating using the broadcasting cel for management maintenance between said access server equipment.
[Claim 10] The SVC access approach in ATM-DSLAM which is an approach according to claim 9 and is characterized by what the process in which the identification information of said access server equipment is included in said broadcasting cel for management maintenance with the information about said intact virtual connection is included for.
[Claim 11] The SVC access approach in ATM-DSLAM characterized by including the process in which the function which carries out termination of said broadcasting cel for management maintenance which is an approach according to claim 9 and was inputted from the network side in the network interface equipment of said hold station is operated alternatively.
[Claim 12] The SVC access approach in ATM-DSLAM which is an approach according to claim 6 and is characterized by including the process in which the virtual connection who was communicating in said hold station side modem equipment based on the **** demand from said subscriber side modem equipment by communicating using the broadcasting cel for management maintenance between said access server equipment is opened.
[Claim 13] The subscriber side modem equipment which performs a strange recovery with a digital subscriber's-loop method goes via the hold station side modem equipment which holds the digital subscriber's loop to which this equipment is connected using the ATM cel transmitted by the Asynchronous Transfer Mode method. Are the approach of accessing the access server equipment connected to an ATM switching network, and it sets to said subscriber side modem equipment. When the upstream which starts transmission of the upstream of predetermined frequency at the time of the initiation of operation, and has the predetermined frequency on said digital subscriber's loop in said hold station side is detected The modem connection approach characterized by including the process which starts actuation of said hold station side modem equipment.
[Claim 14] The modem connection approach which is an approach according to claim 13 and is characterized by including the process in which actuation of said hold station side modem equipment is suspended when the upstream which has the predetermined frequency on said digital subscriber's loop in said hold station side is supervised and this upstream is stopped, after starting actuation of said hold station side modem equipment.
[Claim 15] The modem connection approach which is an approach according to claim 14 and is characterized by what ******** to the communications processing currently performed in this hold station side modem equipment using this hold station side modem equipment and said subscriber side modem equipment just before suspending actuation of said hold station side modem equipment is performed for.
[Claim 16] [Claim 17] which performs ******** to the communications processing currently performed using said hold station side modem equipment and said subscriber side modem equipment in this

subscriber side modem equipment when blocking of the signal transmission from the terminal unit which is an approach according to claim 13 and is connected to said subscriber side modem equipment is detected The subscriber side modem equipment which performs a strange recovery with a digital subscriber's-loop method goes via the hold station side modem equipment which holds the digital subscriber's loop to which this equipment is connected using the ATM cel transmitted by the Asynchronous Transfer Mode method. It is said hold station side modem equipment used for the system which accesses the access server equipment connected to an ATM switching network. The contact always connected with said access server equipment by the permanent virtual connection, The connection management equipment which manages an intact virtual connection within said permanent virtual connection, ATM-DSLAM equipment characterized by including the connection allocation equipment which assigns an intact virtual connection to said subscriber side modem equipment by communicating between said access server equipment based on the call request from said subscriber side modem equipment.

[Claim 18] It is ATM-DSLAM equipment characterized by what a virtual connection intact within said permanent virtual connection is managed for, exchanging the information being equipment according to claim 17 and concerning [said connection management equipment] an intact virtual connection in between said access server equipment using the broadcasting cel for management maintenance.

[Claim 19] ATM-DSLAM equipment characterized by what the network interface equipment which performs alternatively the function which carries out termination of said broadcasting cel for management maintenance which is equipment according to claim 18 and was inputted from the network side is included for.

[Claim 20] When it is equipment according to claim 17 and said connection allocation equipment communicates using the broadcasting cel for management maintenance based on the call request from said subscriber side modem equipment between said access server equipment, it is ATM-DSLAM equipment characterized by what an intact virtual connection is assigned to said subscriber side modem equipment for.

[Claim 21] ATM-DSLAM equipment which is equipment according to claim 20 and is characterized by what the identification information of said access server equipment is included for in said broadcasting cel for management maintenance with the information about said intact virtual connection.

[Claim 22] When it is equipment according to claim 17 and said connection allocation equipment communicates using the broadcasting cel for management maintenance based on the **** demand from said subscriber side modem equipment between said access server equipment, it is ATM-DSLAM equipment characterized by what the virtual connection who was communicating is opened for.

[Claim 23] The subscriber side modem equipment which performs a strange recovery with a digital subscriber's-loop method goes via the hold station side modem equipment which holds the digital subscriber's loop to which this equipment is connected using the ATM cel transmitted by the Asynchronous Transfer Mode method. It is said access server equipment used for the system which accesses the access server equipment connected to an ATM switching network. The contact always connected with said hold station side modem equipment by the permanent virtual connection, The module for ATM-DSL access servers characterized by including the connection management equipment which manages an intact virtual connection within said permanent virtual connection.

[Claim 24] It is the module for ATM-DSL access servers characterized by what a virtual connection intact within said permanent virtual connection is managed for, exchanging the information being equipment according to claim 23 and concerning [said connection management equipment] an intact virtual connection in between said hold station side modem equipment using the broadcasting cel for management maintenance.

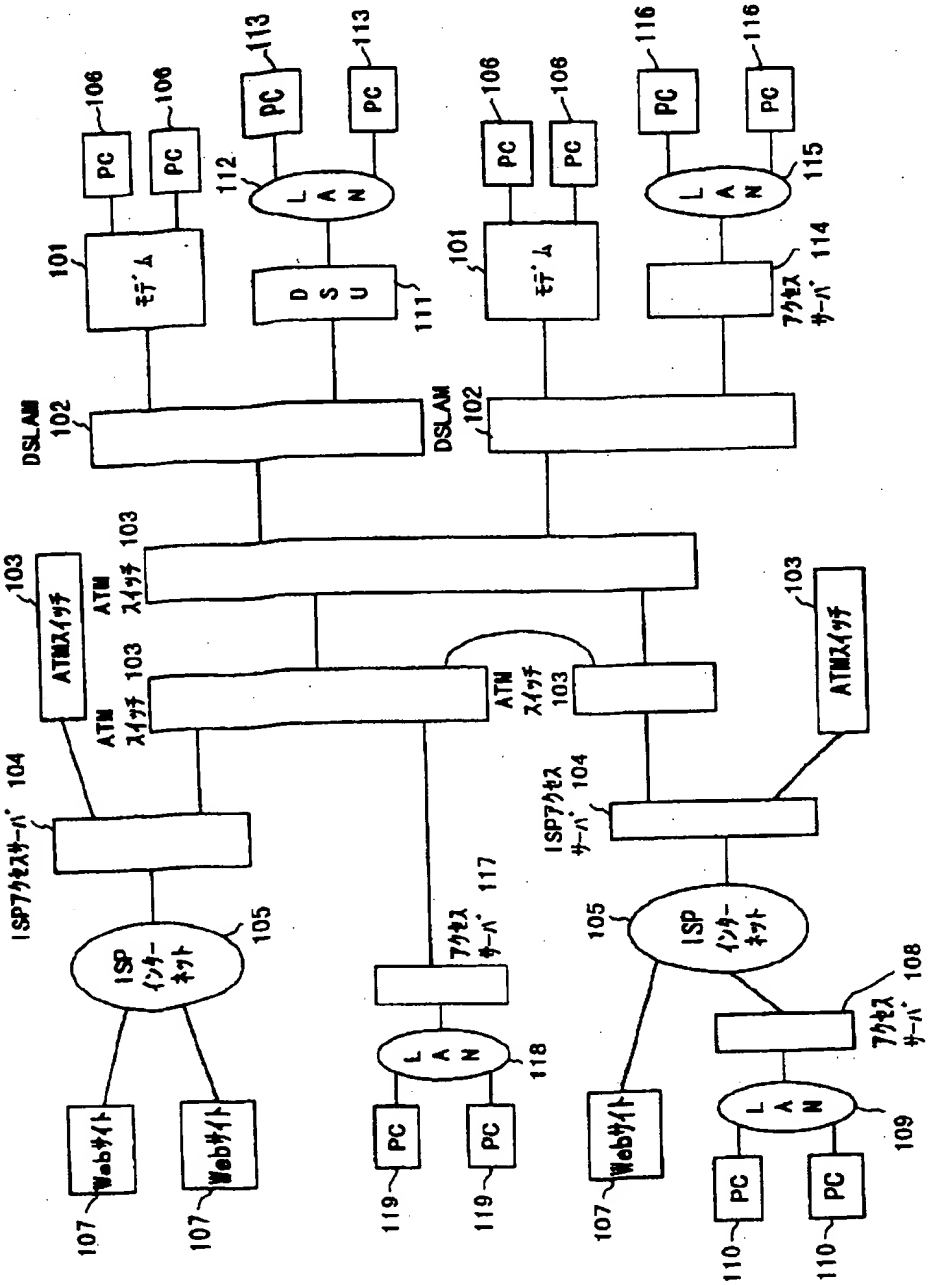
[Claim 25] The subscriber side modem equipment which performs a strange recovery with a digital subscriber's-loop method goes via the hold station side modem equipment which holds the digital subscriber's loop to which this equipment is connected using the ATM cel transmitted by the Asynchronous Transfer Mode method. By being said subscriber side modem equipment used for the system which accesses the access server equipment connected to an ATM switching network, and

transmitting a call request to said hold station side modem equipment ATM-DSL modem equipment characterized by what the connection allocation reception equipment which receives an intact virtual connection's assignment from this hold station side modem equipment is included for.
[Claim 26] The subscriber side modem equipment which performs a strange recovery with a digital subscriber's-loop method goes via the hold station side modem equipment which holds the digital subscriber's loop to which this equipment is connected using the ATM cel transmitted by the Asynchronous Transfer Mode method. It is said hold station side modem equipment used for the system which accesses the access server equipment connected to an ATM switching network. When the upstream detection equipment which detects the upstream which has the predetermined frequency on said digital subscriber's loop, and this upstream detection equipment detect said upstream ATM-DSLAM equipment characterized by including the control unit which starts actuation of each communication device in said hold station side modem equipment corresponding to the digital subscriber's loop by which this upstream was detected.
[Claim 27] It is equipment according to claim 26. Said upstream detection equipment After said control device starts actuation of each communication device in said hold station side modem equipment corresponding to said digital subscriber's loop, The upstream which has the predetermined frequency on this digital subscriber's loop is supervised. Said control unit ATM-DSLAM equipment characterized by what actuation of each communication device in said hold station side modem equipment corresponding to the digital subscriber's loop by which blocking of this upstream was detected is suspended for when said upstream detection equipment detects blocking of said upstream.
[Claim 28] It is ATM-DSLAM equipment characterized by what ******** to the communications processing corresponding to said subscriber side modem equipment connected to this digital subscriber's loop just before it is equipment according to claim 27 and said control device suspends actuation of each communication device in said hold station side modem equipment corresponding to the digital subscriber's loop by which blocking of said upstream was detected is performed for.
[Claim 29] The subscriber side modem equipment which performs a strange recovery with a digital subscriber's-loop method goes via the hold station side modem equipment which holds the digital subscriber's loop to which this equipment is connected using the ATM cel transmitted by the Asynchronous Transfer Mode method. It is said subscriber side modem equipment used for the system which accesses the access server equipment connected to an ATM switching network. Subscriber side modem equipment characterized by what the upstream sending set which starts transmission of the upstream of predetermined frequency at the time of the initiation of operation is included for.
[Claim 30] Subscriber side modem equipment characterized by what the **** demand equipment which publishes a **** demand to said hold station side modem equipment is included for when blocking of the signal transmission from the terminal unit which is equipment according to claim 29 and is connected to said subscriber side modem equipment itself is detected.

[Translation done.]

Drawing selection drawing 1

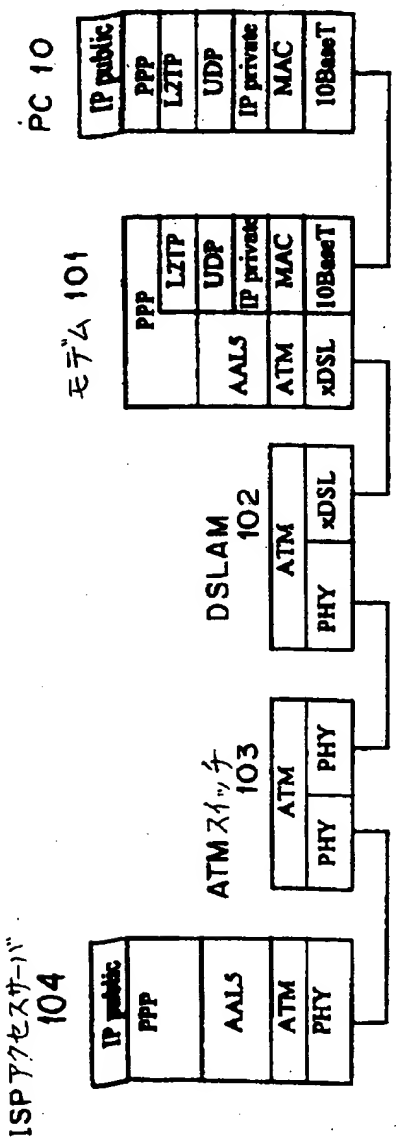
本発明の実施の形態のネットワークシステム構成図



[Translation done.]

Drawing selection drawing 2

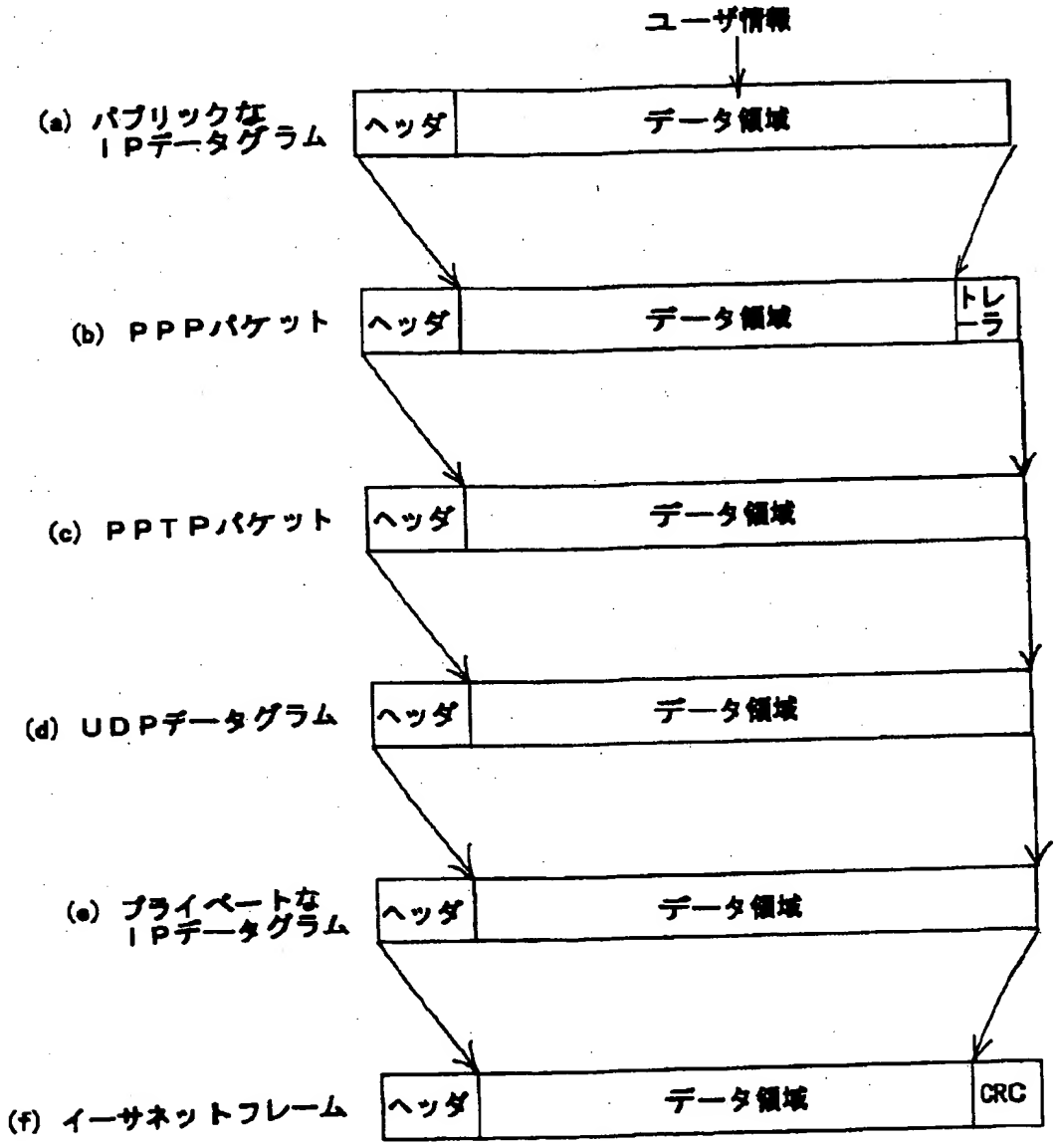
各装置間の通信プロトコルスタックを示す図



[Translation done.]

Drawing selection drawing 3

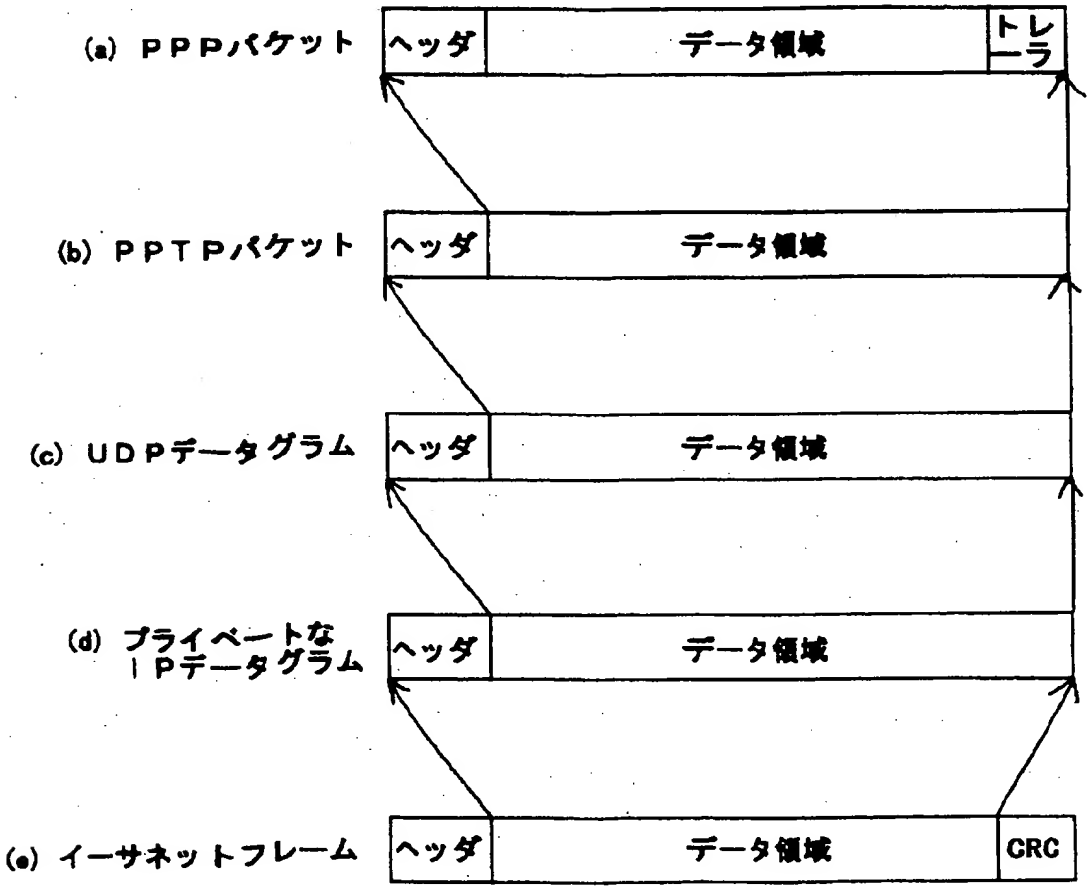
ＰＣ１０６における通信プロトコルスタックのデータフォーマットを示す図



[Translation done.]

Drawing selection drawing 4

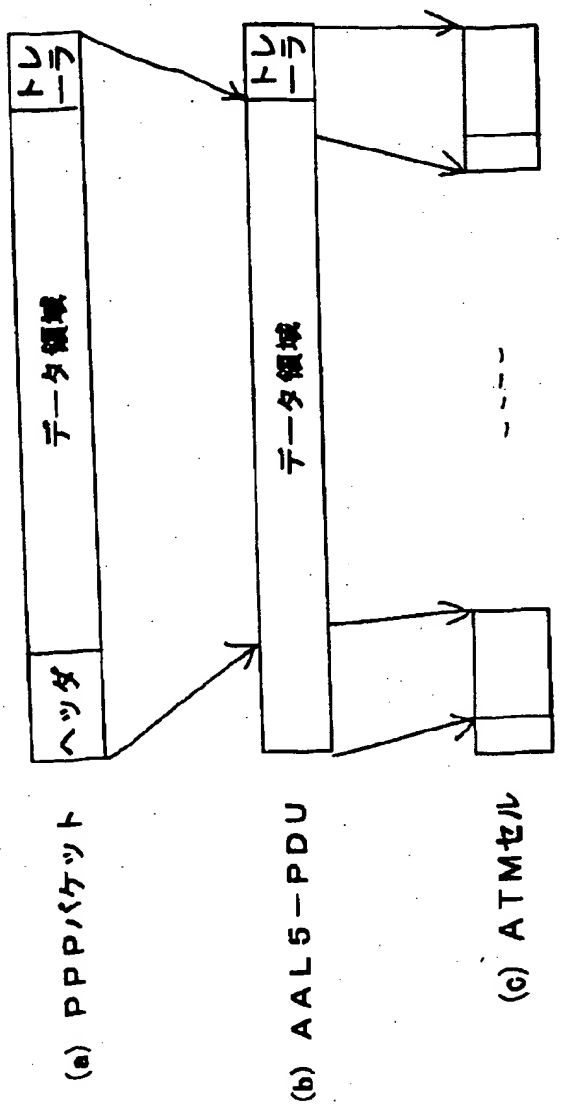
モデム１０１におけるＩＰトンネル側の通信プロトコルスタックのデータフォーマットを示す図



[Translation done.]

Drawing selection drawing 5

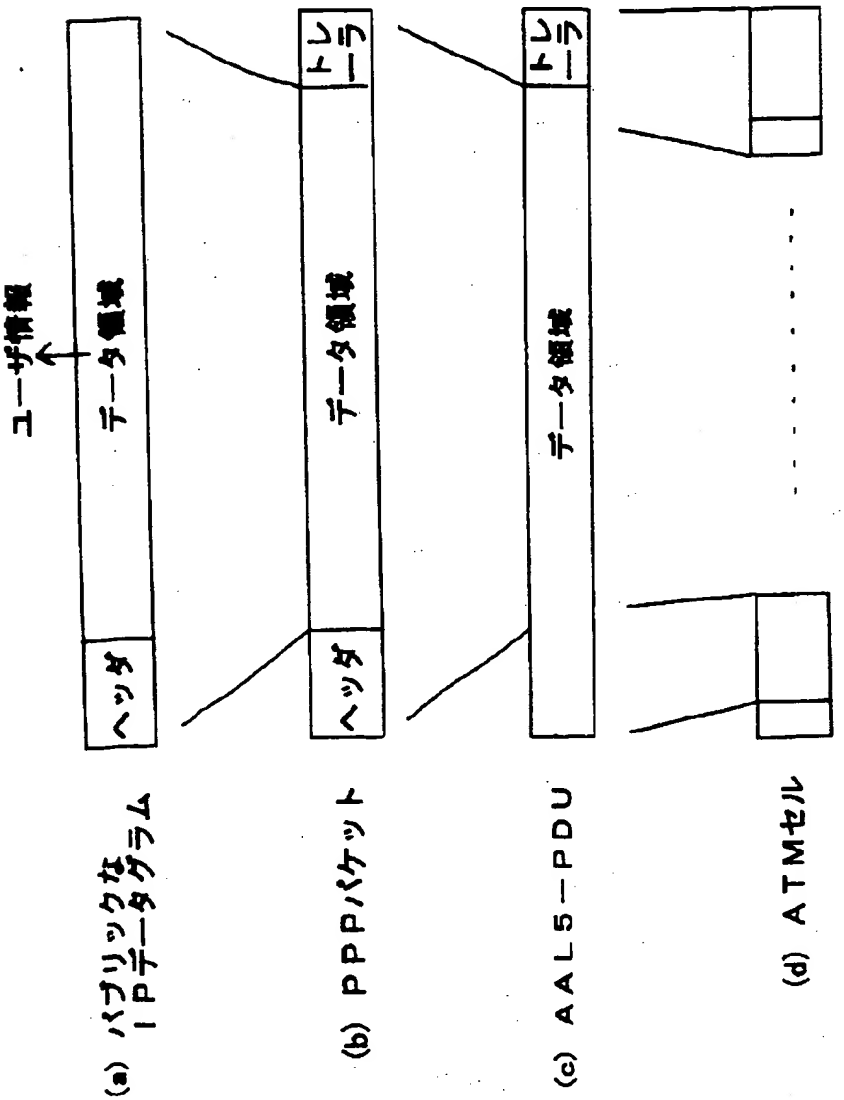
モデム１０１におけるＡＴＭ側の通信プロトコルスタックの
データフォーマットを示す図



[Translation done.]

Drawing selection drawing 6

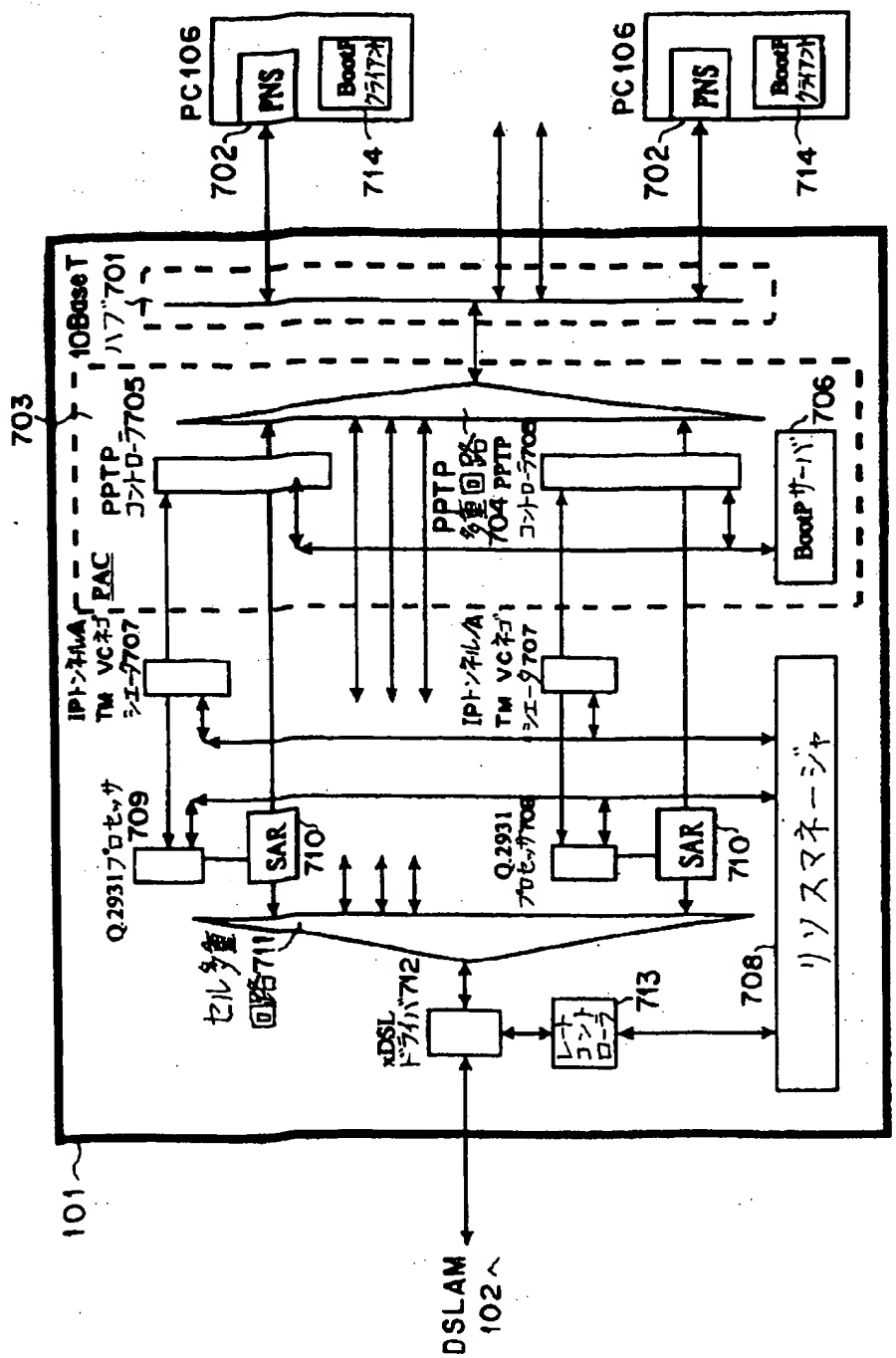
アクセスサーバ１０４における通信プロトコルスタックの
データフォーマットを示す図



[Translation done.]

Drawing selection drawing 7

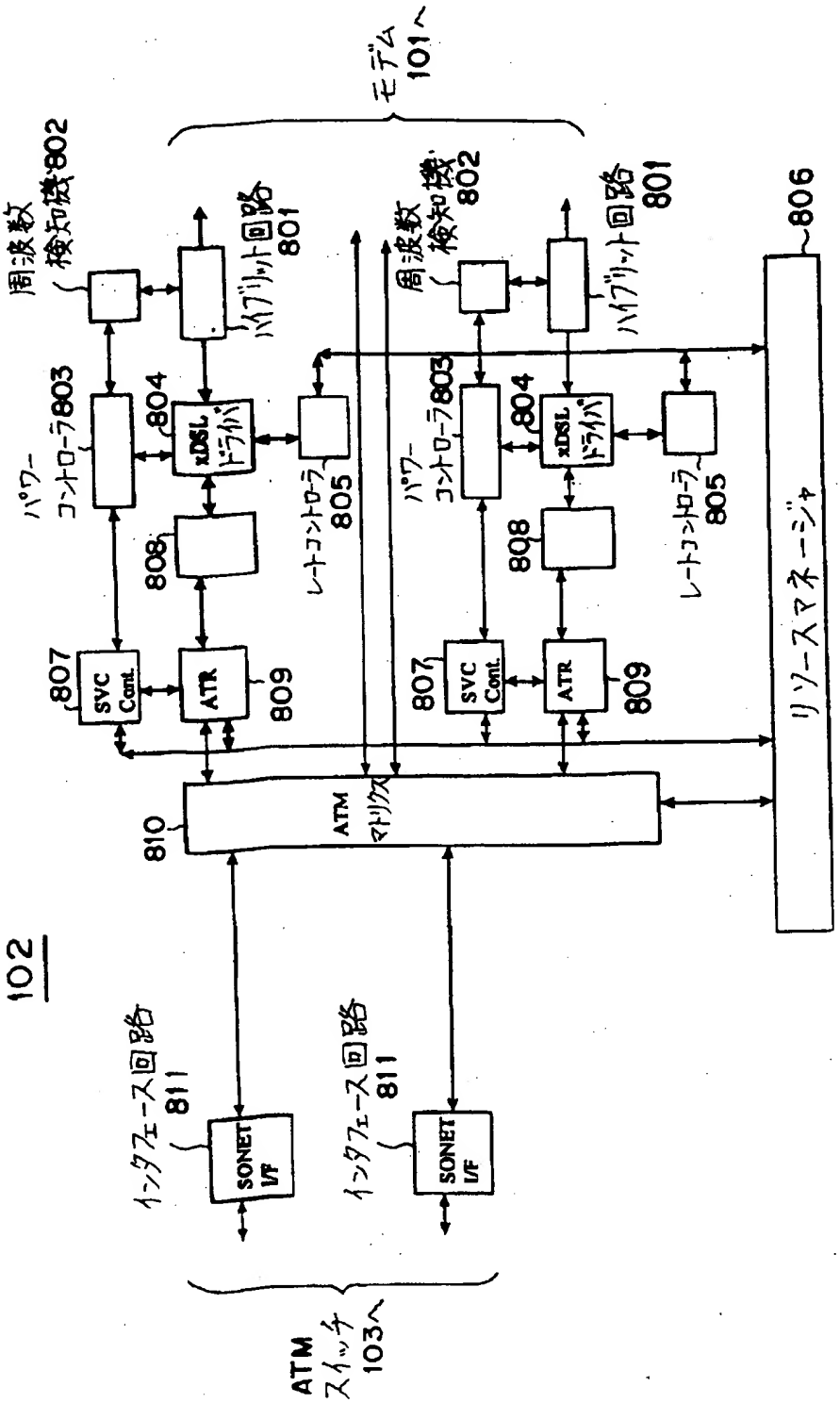
モデム101の回路構成図



[Translation done.]

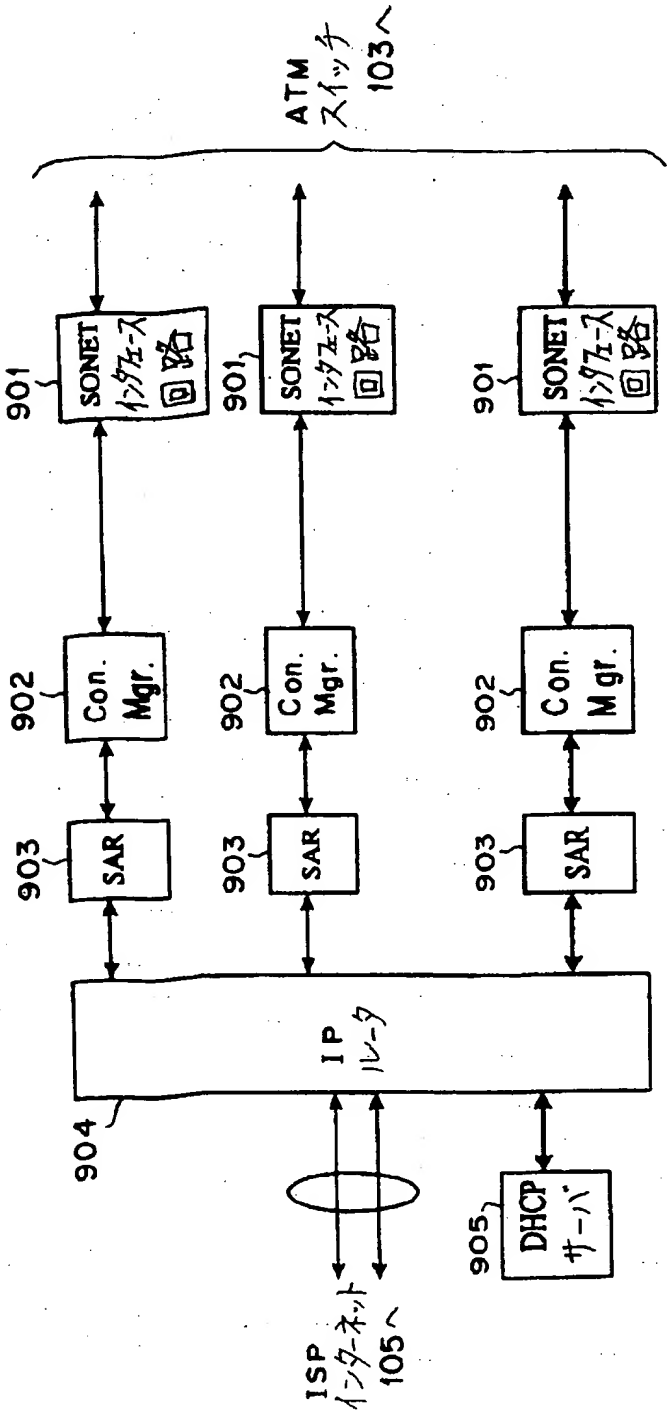
Drawing selection drawing 8

DSLAM 102の回路構成図



Drawing selection drawing 9

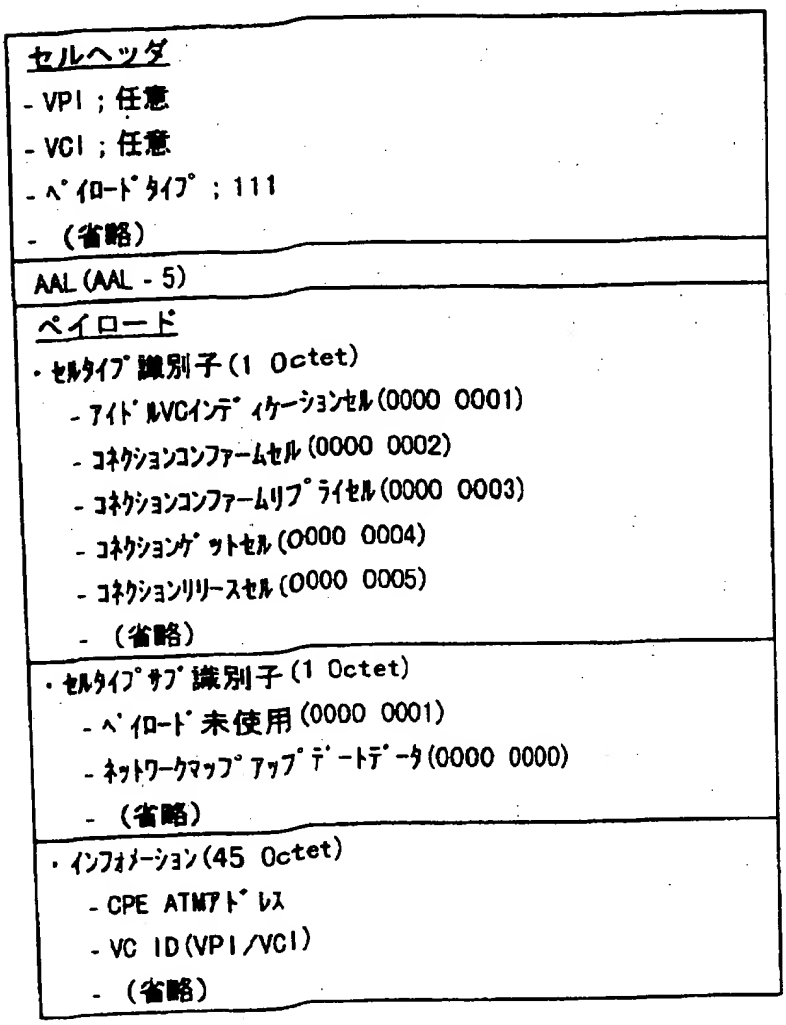
アクセスサーバ104の回路構成図



[Translation done.]

Drawing selection drawing 10

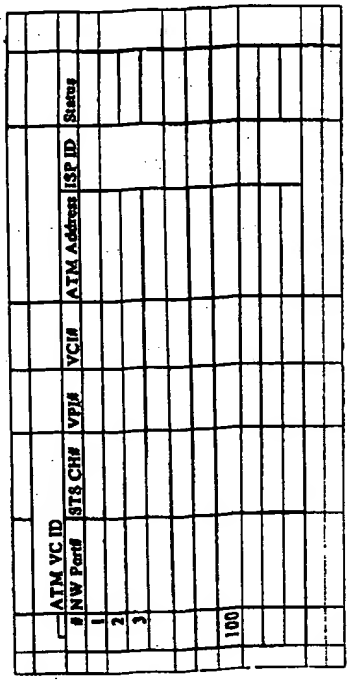
ＯＡＭセルのデータ構成図



[Translation done.]

Drawing selection drawing 11

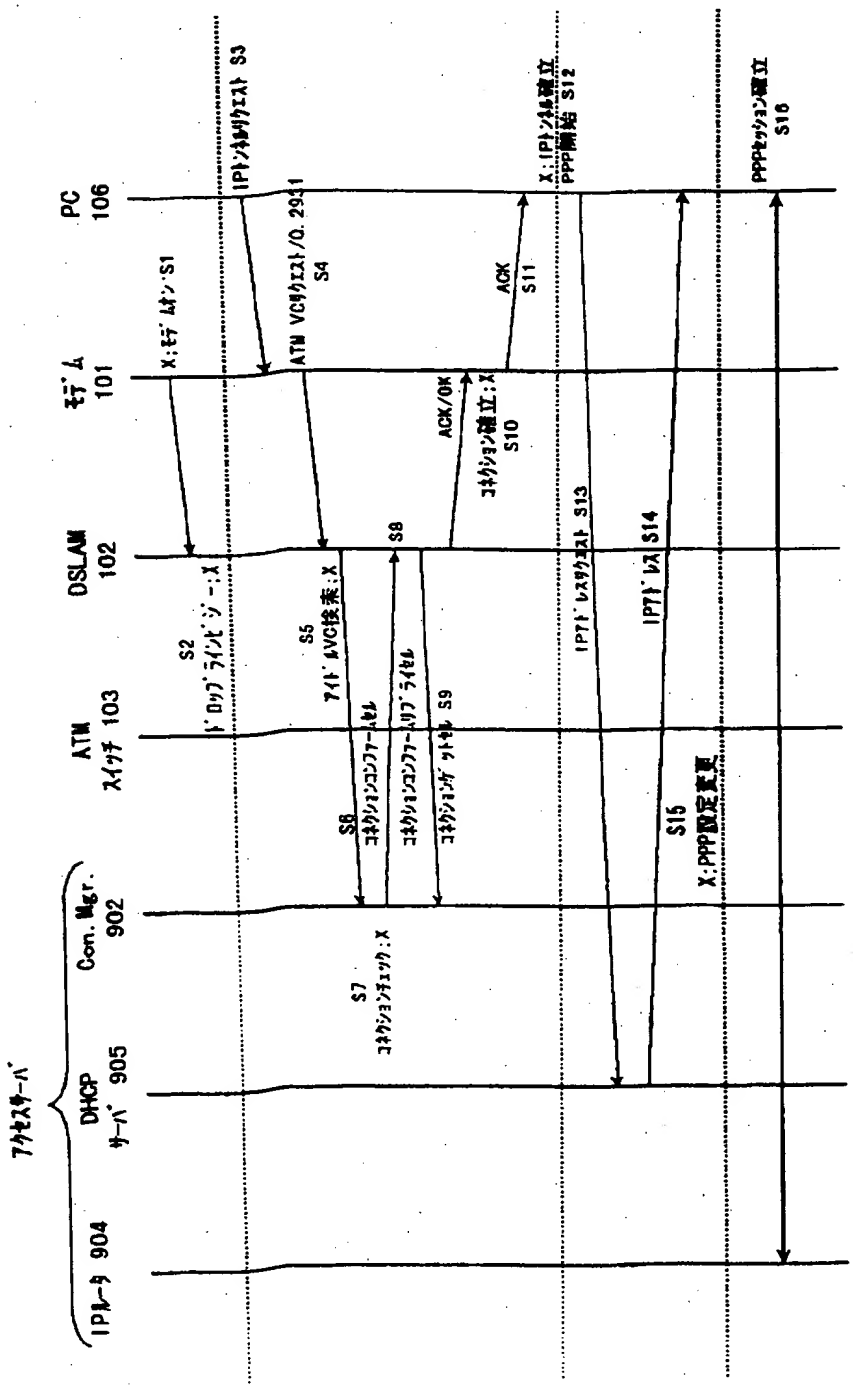
ノミネーテッドVCマップのデータ構成図



[Translation done.]

Drawing selection drawing 12

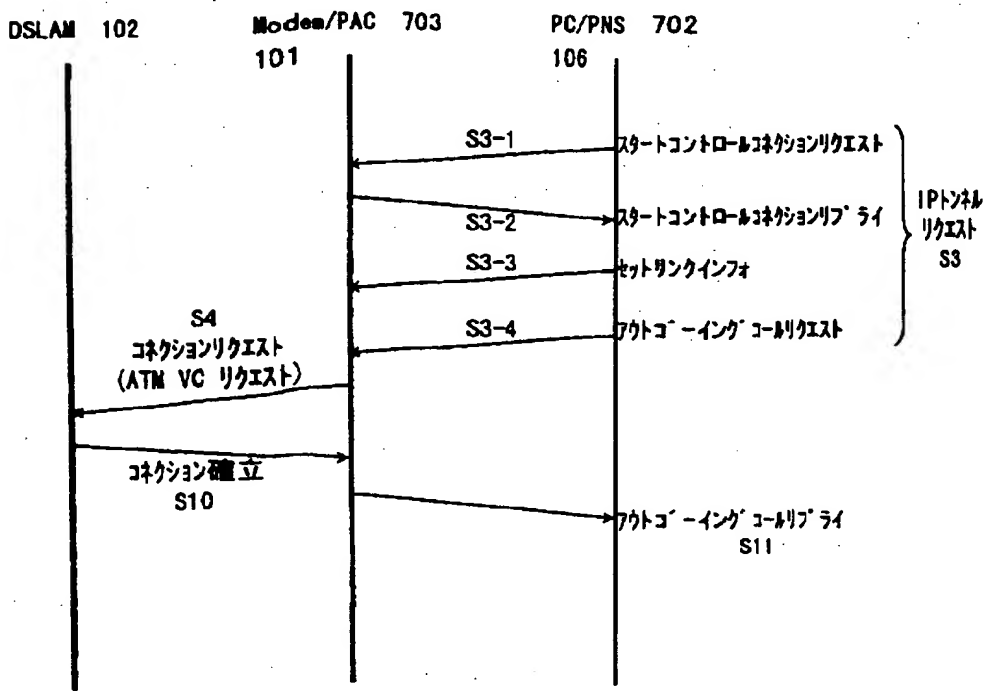
エンド・ツー・エンドコネクションの設定シーケンス図



[Translation done.]

Drawing selection drawing 13

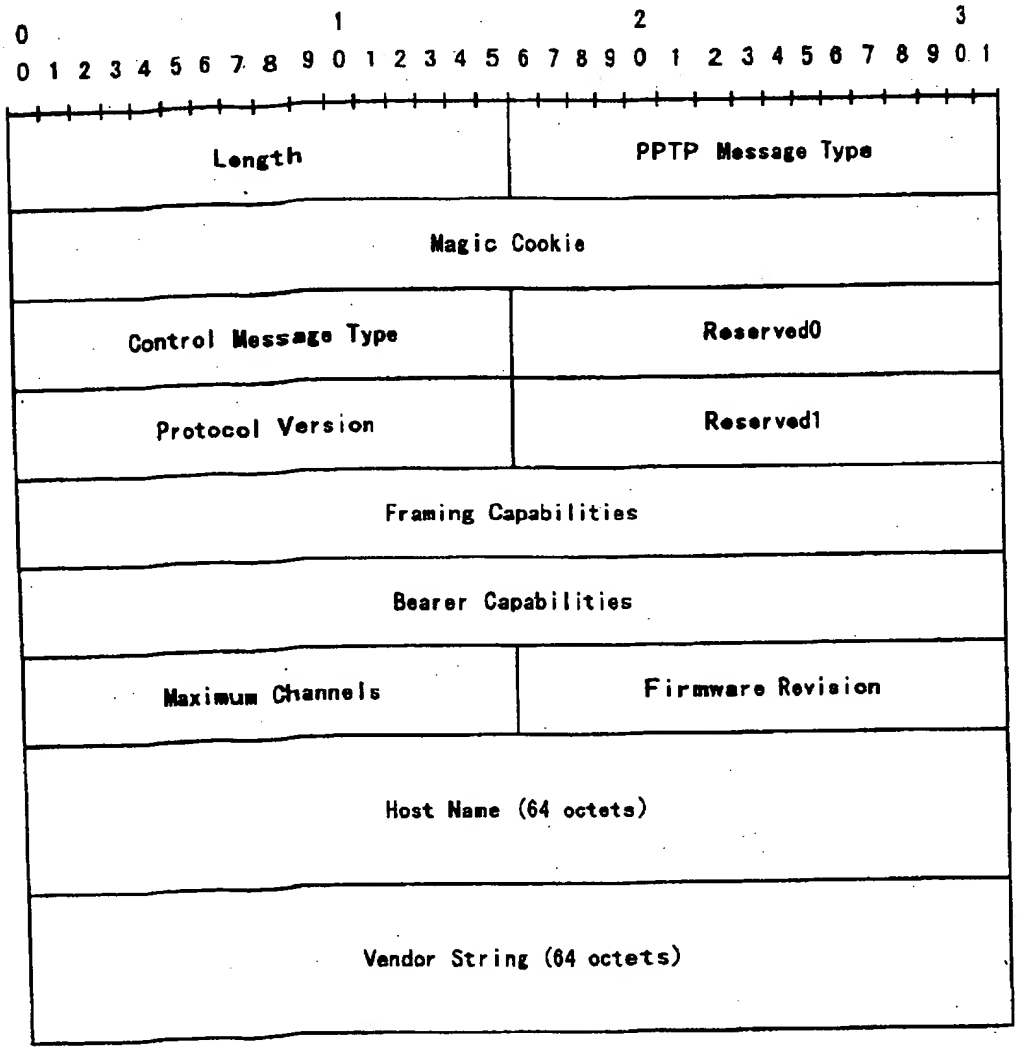
ＩＰトンネルとＡＴＭ ＶＣの接続シーケンス図



[Translation done.]

Drawing selection drawing 14

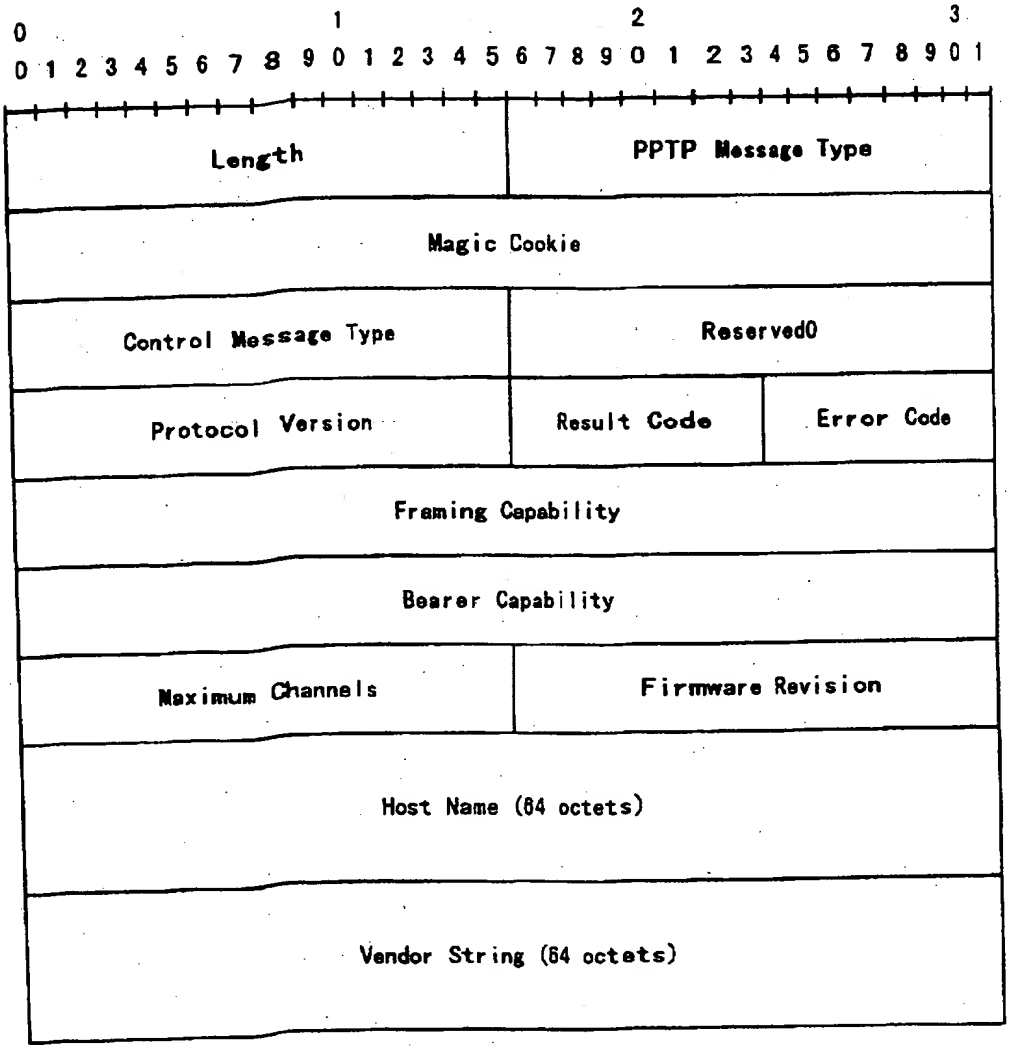
スタートコントロールコネクションリクエストのデータフォーマット図



[Translation done.]

Drawing selection drawing 15

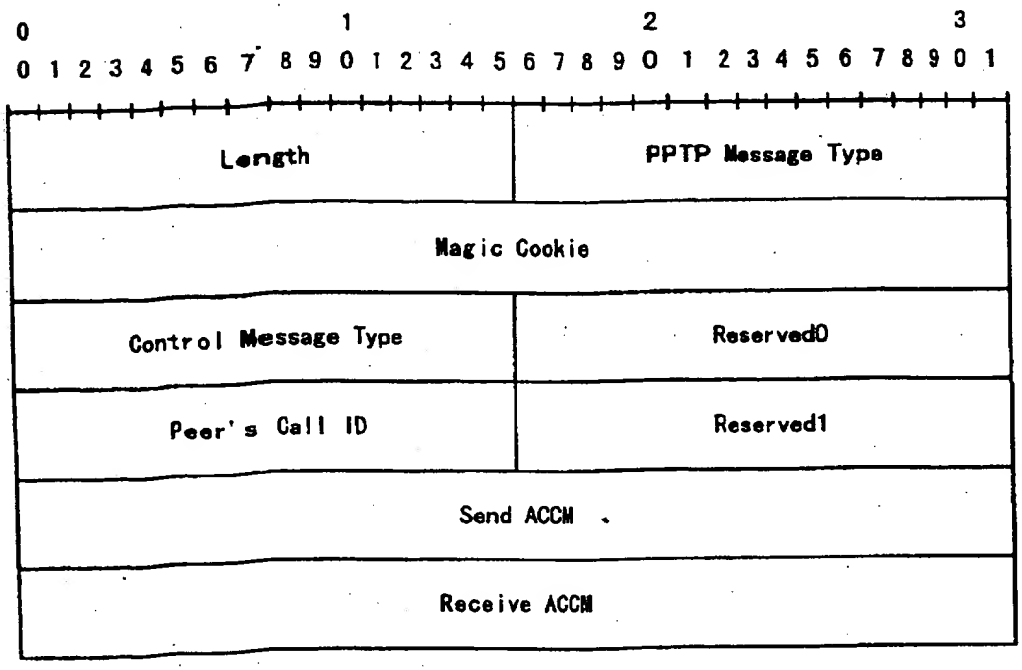
スタートコントロールコネクションリプライのデータフォーマット図



[Translation done.]

Drawing selection drawing 16

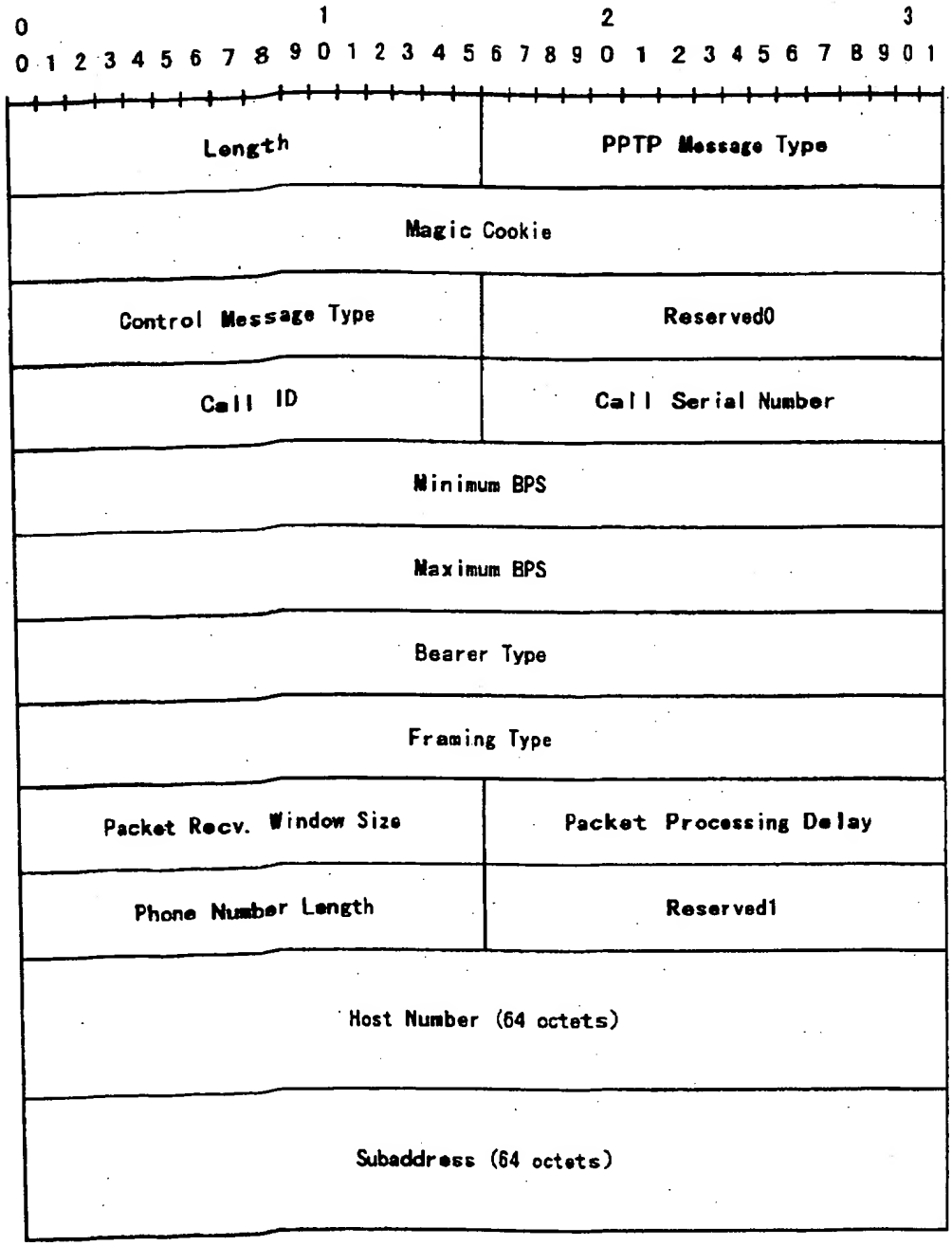
セットリンクインフォのデータフォーマット図



[Translation done.]

Drawing selection drawing 17

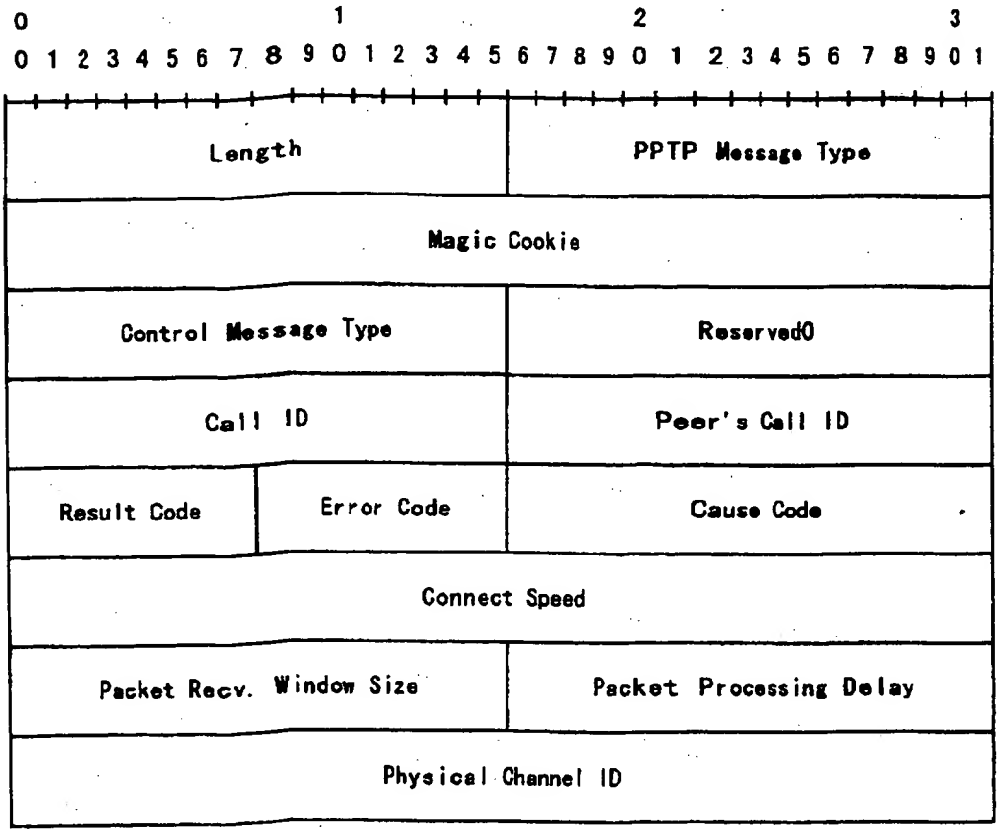
アウトゴーイングコールリクエストのデータフォーマット図



[Translation done.]

Drawing selection drawing 18

アウトゴーイングコールリプライのデータフォーマット図



[Translation done.]

Drawing selection drawing 19

制御セルの一覧を示す図（その１）

#	セル名	方向	機能
1	アイドル VC インディケーションセル	Con. Mgr. →SVC Cont	● その VC が使われていない事を SVC Cont に明示する
2	コネクションコンファームセル	SVC Cont →Con. Mgr.	● SVC Cont が自分の配下のポートのために VC を使いたい時に、まだ使われていない事を Con. Mgr. に確認するために使う
3	コネクションコンファームーリプライセル	Con. Mgr. →SVC Cont	● Con. Mgr. がその VC の状態を SVC Cont に通知するために使う ● SVC Cont はこのセルを受けたら、ドロップ VC をフィーダー VC につなぎこむ
4	コネクションゲットセル	SVC Cont →Con. Mgr.	● コネクションコンファームーリプライセルでその VC が開いている事を確認した SVC Cont がその VC を獲得した事を Con. Mgr. に通知するために使用する ● Con. Mgr. はこのセルを受けたらその VC に関する VC インディケーションセルの送信を停止しなければならない ● もし、このセルを送信した後も相変わらず VC インディケーションセルが送信されていたら SVC Cont はそれが停止するまで再送信する ● システム立ち上げ時に設定されたスレッショルド回数を超えても送信されていたら、SVC Cont はその事を障害情報として外部に出力する
5	コネクションゲットリプライアクノレッジセル	Con. Mgr. →SVC Cont	● コネクションゲットセルを受けた時、もし通知の通り、SVC Cont がその VC を使っていいならば、このセルで応答をする。SVC Cont はこのセルを受けた時はノミネーテッド VC マップの検索をもう一度行う
6	コネクションゲットリプライデニーセル	Con. Mgr. →SVC Cont	● コネクションゲットセルを受けた時、もし別の VC を使うように VC Cont に言う時には、このセルを使う

[Translation done.]

Drawing selection drawing 20

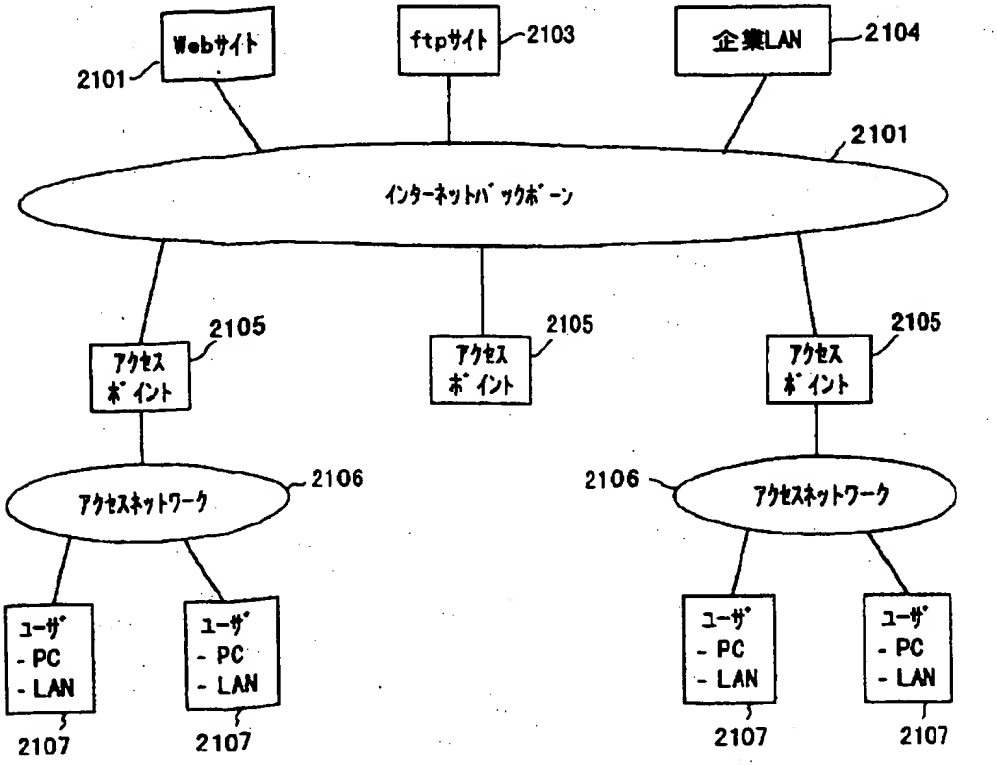
制御セルの一覧を示す図（その２）

7	コネクションリリースセル	SVC Cont →Con. Mgr.	• モデムからの終呼要求があり、SVC Cont がその VC の使用をやめた時、その事を Con. Mgr. に通知する • Con. Mgr. はこのセルを受けたならば、この VC に関してのアイドル VC インディケーションセルの送信を始めなければならない • もし Con. Mgr. が送信を開始しなければ SVC Cont はそれが開始されるまで再送信する • システム立ち上げ時に設定されたスレッショルド回数を超えても送信されていたら、SVC Cont はその事を障害情報として外部に出力する • xDSL ポートがモデムの電源断を検出した時も同じことをする
8	インフォメーショントランスファセル	SVC Cont →Con. Mgr.	• システム運用上必要な情報の転送、特に SVC Cont→Con. Mgr. の方向で使用する • 実際の内容はセルタイプサブ識別子で規定される
9	インフォメーショントランスファセル	Con. Mgr. →SVC Cont	• システム運用上必要な情報の転送、特に Con. Mgr.→SVC Cont. の方向で使用する • 実際の内容はセルタイプサブ識別子で規定される

[Translation done.]

Drawing selection drawing 21

インターネットアクセスシステムの説明図



[Translation done.]